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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/765,522	01/17/2001	Bryant P. Hichwa	OC0101US	9518
22849	7590	11/05/2003	EXAMINER	
SCOTT W HEWETT 400 WEST THIRD STREET #223 SANTA ROSA, CA 95401			STULTZ, JESSICA T	
			ART UNIT	PAPER NUMBER
			2873	

DATE MAILED: 11/05/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/765,522

Applicant(s)

HICHWA ET AL

Examiner

Jessica T Stultz

Art Unit

2873

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on August 28, 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 2,9-11,14-17,19,23,24 and 29-37 is/are allowed.
- 6) ☒ Claim(s) 1,3,4,6-8,12,18,20-22 and 25-28 is/are rejected.
- 7) ☒ Claim(s) 5 and 13 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 May 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 6-8, and 12 are rejected under 35 U.S.C. 102(e) as being anticipated by Aksyuk et al.

Regarding claim 1, Aksyuk et al discloses an optical switch (Column 4, lines 56-67, wherein the optical switch is device “10”, Figure 1) comprising: a mounting substrate (Column 4, lines 56-57, wherein the substrate is frame “25”, Figure 1), a micro-electro-mechanical system die mounted on an edge to the mounting substrate (Column 1, lines 56-67, wherein the MEMS die is the support ring “20”, Figure 1), the MEMs die including a mirror rotatably attached to a base portion of the MEMs die with a flexure hinge (Column 1, line 56-Column 2, line 25 and Column 5, line 66-Column 2, line 19, wherein the mirror is reflector “15”, which is rotated by spring elements “21-22” and “26-27” and hinges “38”, Figure 1), the mirror rotating from a first position to a second position in a plane essentially parallel to a major surface of the MEMS die (Column 1, lines 56-67, wherein the reflector “15”, moves in a plane parallel to the MEMS die “20”, Shown in Figure 1); an input port disposed to couple an optical signal to a first output port when the mirror is in the first position and to couple the optical signal to a second output port

when the mirror is in the second position (Column 9, lines 19-27, wherein Claim 9 discloses a plurality of input and output ports).

Regarding claims 6-8, Aksyuk et al discloses a micro-electro-mechanical system ("MEMs") optical cross connect (Column 4, lines 56-67, wherein the MEMS device is shown in Figure 1 and is disclosed as being a cross-connect in claim 7) comprising: a mounting substrate having a mounting surface (Column 4, lines 56-67, wherein the mounting substrate is frame "25", Figure 1); a first MEMs optical switch cell affixed to the mounting surface on an edge of the first optical switch cell (Column 4, lines 56-67, wherein the MEMS die is the support ring "20", Figure 1) and aligned to direct a first optical beam propagating along a beam path from a first optical input to a first optical output when a first optical switching element specifically a reflector and more specifically a metallic mirror (Column 4, line 56-Column 2, line 25 and Column 5, line 66-Column 2, line 19, wherein the first MEMs cell comprises a mirror "15", which is rotated by spring elements "21-22" and "26-27" and hinges "38", Figure 1), of the first MEMs optical switch cell is in the beam path (Shown in Figure 1); and a second MEMs optical switch cell affixed to the mounting surface and aligned to direct the first optical beam from the first optical input to a second optical output when a second optical switching element of the second MEMs optical switch cell is in the beam path (Columns 9 and 10, disclosed in Claims 4 and 8, wherein the device comprises an array of MEMS actuators) and the first optical switching element is rotated in a plane essentially parallel to the major surface of the first MEMS optical switch die (Shown in Figure 1).

Regarding claim 12, Aksyuk et al further discloses the first MEMs optical switch cell is a latching switch cell configured to maintain the first optical switching element in a first position

in a first switch state and in a second position in a second switch state without applied electrical power (Column 1, line 56-Column 2, line 25 and Column 5, line 66-Column 2, line 19, wherein the reflector "15" is rotated by spring elements "21-22" and "26-27" and hinges "38", Figure 1).

Claim 18 is rejected under 35 U.S.C. 102(e) as being anticipated by Greywall.

Regarding claim 18, Greywall discloses a micro-electro-mechanical system ("MEMs") optical cross connect comprising (Column 2, lines 23-25 and Column 8, lines 15-67, wherein the optical cross connect is shown in Figures 6 and 7): a mounting substrate having a mounting surface (Column 8m lines 15-67, wherein the mounting substrate is "708", Figure 6); a first latching MEMs optical switch cell affixed to the mounting surface on an edge of the first optical switch cell and aligned to direct a first optical beam propagating along a beam path from a first optical input to a first optical output when a first optical switching element (Column 8, lines 15-67, wherein the first switch cell is "700A", which has a mirror "701" and a cell "MT", Figure 7), of the first MEMs optical switch cell is latched in an extended position (Shown in Figures 6-8); and a second MEMs optical switch cell affixed to the mounting surface and aligned to direct the first optical beam from the first optical input to a second optical output when a second mirror of the second MEMs optical switch cell is latched in a second extended portion (Column 8, lines 15-67, wherein the second switch cell is "700B", which has a mirror "701" and a cell "MT", Figure 7) and the first mirror is rotated in a plane essentially parallel to the major surface of the first latching MEMS optical switch cell out of the beam path to latch in a retracted position (Shown in Figures 6-8).

Claim Rejections - 35 USC § 102

Claims 20-21, 25-26, and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Fan et al (embodiment 5).

Regarding claims 20-21, Fan et al (embodiment 5) discloses an optical cross connect comprising (Column 10, lines 25-38, wherein the optical cross connect is shown in Figure 9A): N optical input ports where N is a first integer (Column 10, lines 29-30, wherein the input ports are "920", Figure 9A); M optical output ports where M is a second integer (Column 10, lines 30-31, wherein the output ports are "940"); and $N=M$ (Shown in Figure 9A, where there are there are 4 input and 4 output ports); and N times M micro-electro-mechanical system optical switch dice (Column 10, lines 29-30, wherein there are 16 optical switch dice "930", Figure 9A), each of the micro-electro-mechanical switch dice having a drive capable of switching a mirror from a first position to a second position in response to a switching signal provided to the micro-electro-mechanical die (Column 10, lines 25-38, wherein the switching method is disclosed, Column 13, lines 45-57, wherein the cells are moved by a torsion plate by electrostatic force, Figure 17).

Regarding claim 25, Fan et al (embodiment 5) discloses a method for assembling an optical cross connect (Column 12, lines 19-43, wherein the cross connect is "1310", Figure 13), the method comprising: providing a mounting substrate (Column 12, lines 19-43, wherein the mounting surface is the bottom surface of "1310", Figure 13) with a first optical input, a second optical input, a first optical output, and a second optical output (Shown in Figure 13); optically aligning a first micro-electro-mechanical system die with a first optical switching element to direct a first optical beam from the first optical input to the first optical output (Column 12, lines 19-43 and shown in Figure 13); affixing the first micro-electro-mechanical system die to the

mounting substrate (Column 12, lines 19-43, wherein the first die is "1330"); optically aligning a second micro-electro-mechanical system die with a second optical switching element to direct a second optical beam from the second optical input to the second optical output (Column 12, lines 19-43 and shown in Figure 13); and affixing the second micro-electro-mechanical system die to the mounting substrate (Column 12, lines 19-43, wherein the second die is "1340").

Regarding claims 26, Fan et al (embodiment 5) further discloses a step, after the affixing the first micro-electro-mechanical system die step, of latching the first optical switching element in a retracted position (Column 13, lines 45-57, wherein the switch "1700" is moved by hinges from a first to second position by an actuator, Figure 17).

Regarding claim 28, Fan et al (embodiment 5) further discloses that the first and second optical switching elements are mirrors (Column 12, lines 30-35, wherein the mirrors are "1330 and 1340", Figure 13) and the steps of selecting the first and second micro-electro-mechanical system die according the first and second mirror criteria (Column 12, lines 30-35, wherein the mirrors are "1330 and 1340", Figure 13).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aksyuk et al.

Regarding claims 3 and 4, Aksyuk et al discloses the optical system as disclosed above, but does not specifically disclose that the input port provides the optical signal to the mirror in

the second position at an angle of between about 15-45 degrees and less than 22.5 degrees from a normal of the mirror. However, it would have been obvious to one having ordinary skill in the art of MEMS switching devices for the input port to provide an optical signal to the mirror at an angle between 15-22.5 degrees for the purpose of guiding the light to the appropriate output port.

Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al (embodiment 5) as disclosed above in claim 20, in view of Fan et al (embodiment 4).

Regarding claim 22, Fan et al (embodiment 5) discloses an optical switch as disclosed above in claim 20, but does not specifically disclose that the drive is a magnetic drive. Fan et al (embodiment 4) teaches of an optical cross connect being driven by a magnetic field so that vertical perm alloy mirrors can be driven (Column 10, lines 1-8). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the optical switch of Fan et al (embodiment 5) to further be driven by a magnetic field so that vertical perm alloy mirrors can be driven.

Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fan et al (embodiment 5) as disclosed above in claims 26, in view of Fan et al (embodiment 3).

Regarding claim 27, Fan et al (embodiment 5) discloses a method for assembling an optical cross connect as disclosed above in claim 26, but does not specifically disclose that the latching step includes applying a mechanical force. Fan et al (embodiment 3) teaches of a method for assembling an optical cross connect being driven by a mechanical force so that the hinged mirrors can be driven (Column 9, lines 64-67). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made for the method of

assembling an optical cross connect of Fan et al (embodiment 5) further include an optical cross connect being driven by a mechanical force so that the hinged mirrors can be driven.

Allowable Subject Matter

Claims 2, 9-11, 14-17, 19, 23-24, and 29-37 are allowed.

Claims 5 and 13 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: none of the prior art alone or in combination disclose or teach of the claimed combination of limitations to warrant a rejection under 35 USC 102 or 103.

Specifically regarding independent claim 2, none of the prior art alone or in combination disclose or teach of the claimed optical switch specifically wherein the mirror is formed on a smoothed major crystal plane of a layer of single-crystal silicon and has a reflectivity greater than 96%.

Specifically regarding claims 5 and 13, none of the prior art alone or in combination disclose or teach of the claimed optical switch specifically wherein the mirror has a first mirrored surface and a second mirrored surface.

Specifically regarding independent claim 9, none of the prior art alone or in combination disclose or teach of the claimed MEMs optical cross connect specifically wherein at least one of the first and second metallic mirrors has a minimum face dimension of greater than about 400 microns.

Specifically regarding independent claim 14, none of the prior art alone or in combination disclose or teach of the claimed optical switch specifically wherein the first mirrored side and the second mirrored side is formed on a smoothed major crystal plane of a layer of single-crystal silicon and has a reflectivity greater than 96%.

Specifically regarding independent claim 15, none of the prior art alone or in combination disclose or teach of the claimed optical switch specifically wherein first optical input is disposed between 12-57 mm from the first optical output.

Specifically regarding independent claim 16, none of the prior art alone or in combination disclose or teach of the claimed optical switch specifically wherein first optical input is disposed between 12-57 mm from the first optical output and wherein at least one of the first and second metallic mirrors has a minimum face dimension of greater than about 400 microns.

Specifically regarding independent claim 19, none of the prior art alone or in combination disclose or teach of the claimed MEMs optical cross connect specifically wherein the first metallic mirror has a minimum face dimension of greater than about 400 microns.

Specifically regarding independent claim 23, none of the prior art alone or in combination disclose or teach of the claimed optical cross connect specifically wherein the switching signal has a maximum voltage less than 10 volts.

Specifically regarding independent claim 24, none of the prior art alone or in combination disclose or teach of the claimed optical cross connect specifically wherein the optical cross connect switches 2N optical switch dice in less than about 50mS with an average power consumption of less than 2N/50 Watts.

Specifically regarding independent claims 29 and 33-35 none of the prior art alone or in combination disclose or teach of the claimed method for operating an optical cross connect specifically involving measuring and comparing an impedance of the optical switch to a reference value and providing a switch state output.

Specifically regarding independent claim 37 none of the prior art alone or in combination disclose or teach of the claimed method of manufacturing an optical cross connect wherein the cross is operated in a manner by providing a plurality of electronic control signals to a plurality of micro-electro-mechanical system optical switch dice in the optical cross connect to configure the optical cross connect to a selected configuration; removing electrical input to the optical cross connect; and maintaining the selected configuration.

Response to Arguments

Applicant's arguments with respect to claims 1, 3-4, 6-8, 12, and 18 have been considered but are moot in view of the new ground(s) of rejection.

Applicant's arguments filed August 28, 2002 have been fully considered but they are not persuasive. Regarding claims 20-22, and 25-28, the examiner does not agree with the argument that Fan et al does not disclose dice since dice is defined as "a perforated block through which metal or plastic is drawn or extruded for shaping" and the cells switching cells (930) are blocks that hold a reflective material and are therefore dice. Regarding the argument that the mirrors are not individually controlled it is inherent that the cells are individually controlled since the switches are activated at different times (Column 10, lines 16-38) are the uniform coupling loss is achieved by the architecture of the matrix rather than the time the switches are activated.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Goldstein is cited as being some similar structure to the claimed invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jessica T Stultz whose telephone number is (703) 305-6106. The examiner can normally be reached on M-F 8-4:30.

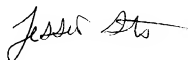
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Epps can be reached on 703-308-4883. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.


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Jessica Stultz

 10/21/03

JORDAN SCHWARTZ
PRIMARY EXAMINER